

**DISTRIBUTION, SEASONAL ABUNDANCE AND HOST PREFERENCE
OF FLEAS IN NEW ENGLAND¹**
(SIPHONAPTERA)

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ABSTRACT—During arbovirus surveillance in Massachusetts, fleas were collected from 30 species and subspecies of mammals. A total of 1802 fleas of 26 species was collected and identified. Data from these collections are combined with unpublished and published records; the distribution, seasonal abundance, and host preferences are compiled for 43 species of New England fleas.

As part of the routine handling of birds and mammals for arbovirus surveillance in Massachusetts, ectoparasites were collected and identified by the writer. The data on fleas collected during this survey are presented here.

This paper is a compilation of these new records with previously published and unpublished records from New England. Distribution is presented by states and counties. Parasite-host relationships are listed as host preferences for each flea species. Hosts are given in the order of frequency that they are parasitized by each fleas species. A synopsis of host-parasite relationships is also presented. Fleas are listed in the order of abundance for each host from which they have been reported in New England. Host-flea relationships recorded during the present survey are marked with an asterisk (*) in both of these lists. The following arrangement of families, genera, species and subspecies of New England fleas has been adapted from Jellison & Glesne (1967).

PULICIDAE

Cediopsylla simplex (Baker), 1895

Distribution: CONN: Litchfield, Middlesex; RI: Kent, Providence, Washington; MASS: Barnstable, Berkshire, Bristol, Dukes, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester; VT: Rutland, Windham; NH: Strafford; ME.

Seasonal abundance: *C. simplex* has been collected during all months of the year in New England. However, approximately 75 percent of these collections have been made in the spring. This may reflect the seasonality of rabbit trapping rather than the relative abundance of the flea.

Host preferences: This species is found on lagomorphs (84%) and their predators (16%): *Sylvilagus floridanus*,* *Sylvilagus transitionalis*,* *Lepus americanus*,* *Vulpes fulva*,* *Lynx rufus*, *Urocyon cinereoargenteus*, *Felis domestica*, *Peromyscus*

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leucopus, and *Tamiasciurus hudsonicus*.* The three rodent species, each represented by a single collection, are accidental hosts.

Previous records: Fox (1940), Fuller (1943), Hopkins and Rothschild (1953), Cressey (1961), Parsons (1962), Mathewson and Hyland (1964), and Osgood (1964).

New records: During this survey, 124 males and 200 females were collected from 34 hosts of 5 species.

Hoplopsyllus glacialis lynx (Baker), 1904

Distribution: VT: Essex, Orleans; NH: Coos, Grafton, Hillsborough; ME: Aroostook.

Seasonal abundance: Collection of *H. g. lynx*, although scarce, have been made in all seasons. Recoveries have been most frequent in the winter and early spring.

Host preferences: This species is found on predators (60%) and hares (40%): *Lynx canadensis* and *Lepus americanus*.

Previous records: Jordan (1929, 1937), Fuller (1934), Hopkins and Rothschild (1953), Johnson (1955), Miller (1962), and Osgood (1964).

Echidnophaga gallinacea (Westwood), 1875

E. gallinacea was reported from Providence, Rhode Island, by Trembley and Bishopp (1940). This Old World species is common in southern United States on domestic fowl and rats. Pratt and Good (1954) state that this species becomes progressively rarer north of Maryland. However, it may be introduced periodically into New England on birds or seafaring rats.

Pulex irritans (Linnaeus), 1785

This species has been reported in New England by Fox (1940) and Trembley and Bishopp (1940) from the seaport cities of New Bedford and Fall River in Massachusetts.

Ctenocephalides canis (Curtis), 1826

Distribution: CONN: Hartford; RI: Providence; MASS: Bristol, Essex; VT: Rutland, Windham; NH: Rockingham; ME: Knox, Oxford.

Seasonal abundance: Published records of this species have been too few to warrant any conclusion as to the seasonal distribution. Collections were reported during May, July, and August.

Host preferences: In addition to *Canis familiaris** and *F. domestica*, this flea has been collected from *Rattus* spp. and *Marmota monax*. It is often taken in buildings and will feed on man in the absence of preferred hosts.

Previous records: Robinson (1913), Fox (1940), Trembley and Bishopp (1940), Fuller (1943), Parsons (1962), and Osgood (1964).

New records: Raynham (Bristol County) Mass., v. 66, 6 males, 6 females, ex. *C. familiaris*.

Ctenocephalides felis felis (Bouche), 1835

Distribution: CONN: Fairfield, Hartford, New Haven, Tolland, Windham; RI: Kent, Providence, Washington; MASS: Bristol, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester; VT: Rutland, Windham, Windsor; NH: Carroll, Rockingham; ME: Cumberland.

Seasonal abundance: Collections of this species have been recorded during all seasons of the year, but most abundantly in the warmer months.

Host preferences: In addition to *C. familiaris*,* *F. domestica*,* and man, *C. f. felis* has also been taken on *Didelphis marsupialis*,* *Procyon lotor*,* *Mephitis mephitis*,* and *Oryctolagus cuniculus*.* It has also been collected in buildings and will readily bite man.

Previous records: Fox (1940), Trembley and Bishopp (1940), Fuller (1943), Cressey (1961), Mathewson and Hyland (1964), and Osgood (1964).

New records: Seven males and 18 females were collected from 10 hosts representing 6 species.

Xenopsylla cheopis (Rothschild), 1903

Distribution: RI: Providence; MASS: Suffolk; VT: Windsor; NH: Hillsboro.

Seasonal abundance: *X. cheopis* has been collected during all months of the year.

Host preferences: Murine rats account for all but two collections of this flea. Single collections were reported from *Mus musculus* and *F. domestica*.

Robinson (1913) reported 195 of 341 rats in Providence, R.I., were infested with a total of 2053 fleas of 4 species. Seventy-five percent of these fleas were *X. cheopis*. Fox and Sullivan (1925) found 648 of 1524 rats in Boston, Mass., were parasitized with 1896 fleas of 5 species. *X. cheopis* accounted for 33.4% of the fleas encountered.

Previous records: Robinson (1913), Fox and Sullivan (1925), Fox (1940), Trembley and Bishopp (1940), Fuller (1943), Pratt and Good (1954), Cressey (1961), and Osgood (1964).

VERMIPSYLLIDAE

Chaetopsylla lotoris (Stewart), 1926

Distribution: MASS: Franklin, Hampshire, Plymouth; VT: Rutland; NH: Carroll, Cheshire, Stratford; ME.

Seasonal abundance: Specimens were collected in New England during the spring, fall, and winter.

Host preferences: The true host of *C. lotoris* is apparently *P. lotor*,* although the role of other carnivores need further study: *L. rufus*, *V. fulva*, and *U. cinereo-argenteus*.* A single collection is recorded from a rodent—*T. hudsonicus*.

Previous records: Fox (1940), Blicke (1959), Parsons (1962), and Osgood (1964).

New records: Leverett (Franklin Co.) Mass., 14. III. 67, 1 male, 5 females, ex *P. lotor*; Plymouth (Plymouth Co.) Mass., 5. IV. 65, 1 female, ex *U. cinereo-argenteus*.

HYSTRICHOPSYLLIDAE

Conorhinopsylla stanfordi Stewart, 1930

Distribution: MASS: Franklin; VT: Rutland.

Seasonal abundance: The only two collections of this species were made during February.

Host preferences: Both collections were from *Glaucomys volans*.

Previous records: Parsons (1962) and Osgood (1964).

Atyphloceras bishopi Jordan, 1933

Distribution: RI: Newport, Providence; MASS: Bristol, Plymouth.

Seasonal abundance: *A. bishopi* has been collected during the spring and fall months in New England.

Host preferences: Collections of this species have been from microtine and murine rodents: *Microtus pennsylvanicus*,* *Rattus norvegicus*,* and *Clethrionomys gapperi*.* Meadow voles are considered to be the preferred host.

Previous records: Cressey (1961) and Mathewson and Hyland (1964).

New records: Nine males and 11 females were collected from 9 hosts of 3 species.

Hystrichopsylla tahavuana Jordan, 1929

Distribution: VT: Rutland; NH: Merrimack.

Seasonal abundance and host preferences: *H. tahavuana* has been collected only twice in New England—from *M. pennsylvanicus* and *Scalopus aquaticus*.

Previous records: Fuller (1943) and Osgood (1964).

Catallagia borealis Ewing, 1929

Distribution: VT: Rutland; ME: Piscataquis.

Seasonal abundance and host preferences: Although the type locality is Basin Pond, Mount Katahdin, Maine, *C. borealis* has been reported only twice in New England. Specimens were collected from *C. gapperi* and *M. pennsylvanicus*.

Previous records: Ewing (1929) and Osgood (1964).

Epitedia faceta (Rothschild), 1915

Distribution: MASS: Franklin, Hampden.

Seasonal abundance: Specimens were collected during February and March.

Host preferences: Although the type specimens (collected in Wilbraham, Mass.) were taken from *T. hudsonicus*, *G. volans** appears to be a preferred host.

Previous records: New England records are limited to the holotype and allotype (Rothschild, 1915; Hopkins and Rothschild, 1962).

New records: The following specimens were collected from *G. volans* in Leverett (Franklin Co.) Mass: 17. II. 67, 1 male, 3 females; 19. II. 67, 1 female; 21. II. 67, 1 female; 23. II. 67, 3 males, 1 female; 26. II. 67, 2 males, 1 female; 15. III. 67, 1 male.

Epitedia weymanni (Rothschild), 1904

Distribution: CONN: New Haven; RI: Kent, Newport; MASS: Barnstable, Bristol, Dukes, Franklin, Hampshire, Middlesex, Norfolk, Plymouth, Worcester; VT: Caledonia, Rutland; NH: Carroll, Grafton; ME.

This species reported to be represented by two subspecies in New England—*E. w. weymanni* (Rothschild) to the north and *E. w. testor* (Rothschild) to the south.

Seasonal abundance: This flea appears to be most abundant during the spring and fall; it is less frequently taken during the winter months and rarely collected during the summer.

Host preferences: *E. weymanni* has been collected from a wide variety of mammals including rodents (96%), insectivores (2%), carnivores (2%), lagomorphs: *P. leucopus** (and nest), *C. gapperi*,* *G. volans*, *Peromyscus maniculatus*,* *M.*

*pennsylvanicus** (and nest), *Blarina brevicauda**, *T. hudsonicus**, *S. carolinensis**, *R. norvegicus**, *Mustela erminea*, *P. lotor**, *Microtus breweri*, *Erethizon dorsatum**, *M. mephitis**, *Mustela frenata*, and *Sylvilagus* sp.

Previous records: Fox (1940), Fuller (1943), Benton (1955), Cressey (1961), Parsons (1962), Hopkins and Rothschild (1962), Mathewson and Hyland (1964), and Osgood (1964).

New records: During the present survey 54 male and 101 female *E. w. wemmanni* were collected from 71 hosts representing 12 species and subspecies.

Tamiophila grandis (Rothschild), 1902

Distribution: RI: Washington; MASS: Barnstable, Franklin, Hampshire, Norfolk, Plymouth, Worcester; VT: Rutland, Windham; NH: Carroll.

Seasonal abundance: *T. grandis* has been collected most frequently during the spring and fall months.

Host preferences: This species has been collected from chipmunks (65%), from predators of chipmunks (31%), and from ecological associates of chipmunks (4%): *Tamias striatus** (and nests), *C. familiaris*, *M. frenata*, *T. hudsonicus*, and *P. leucopus*.

Previous records: Fuller (1943), Parsons (1962), Mathewson and Hyland (1964) and Osgood (1964).

New records: Amherst (Hampshire Co.) Mass., 20. V. 67, 4 females, ex *T. striatus*; Middleboro (Plymouth Co.) Mass., 6. XI. 67, 1 female, ex *T. striatus*.

Rhadinopsylla orama Smith, 1957

This species has been recorded only once in New England. Fuller (1943) collected a male and a female from *M. pennsylvanicus* in Edgartown (Dukes Co.) Mass.

Corrodopsylla curvata curvata (Rothschild), 1915

C. c. curvata has been collected three times in this area. All three collections were single males from shrews (*B. brevicauda* and *Sorex* sp.). Specimens were taken in Rutland Co. Vermont by Osgood (1964) and in Providence Co. Rhode Island by Mathewson and Hyland (1964).

Ctenophthalmus pseudagyrtes pseudagyrtes Baker, 1904

Distribution: CONN: Hartford, New Haven; RI: Kent, Newport, Providence, Washington; MASS: Barnstable, Bristol, Dukes, Franklin, Hampshire, Middlesex, Norfolk, Plymouth, Worcester; VT: Addison, Caledonia, Rutland; NH: Carroll, Merrimack; ME: Piscataquis.

Seasonal abundance: *C. p. pseudagyrtes* has been collected during all months of the year, but most frequently in the spring and least frequently during the winter.

Host preferences: This species has been collected from a wide variety of animals including rodents (74%), insectivores (24%), birds (1%), lagomorphs (½%), carnivores (½%), and marsupials: *M. pennsylvanicus** (and nest), *B. brevicauda**, *C. gapperi**, *P. leucopus** (and nest), *Condylura cristata*, *Synaptomys cooperi**, *R. norvegicus**, *T. striatus**, *P. maniculatus**, *Napaeozapus insignis*, *Otus asio*, *Parascalopus breweri*, *Microtus pinetorum*, *T. hudsonicus*, *M. monax*, *S. floridanus*, *M. frenata**, and *D. marsupialis*.

Previous records: Baker (1898, 1904), Fox and Sullivan (1925), Fox (1940),

Fuller (1943), Knutson and Szymkowicz (1952), Cressey (1961), Parsons (1962), Mathewson and Hyland (1964), Osgood (1964), and Hopkins and Rothschild (1966).

New records: During this survey, 89 males and 73 females were collected from 72 hosts representing 11 species and subspecies.

Doratopsylla blarinae Fox, 1914

Distribution: CONN: Hartford, Windham; RI: Kent, Newport, Washington; MASS: Barnstable, Bristol, Dukes, Hampshire, Middlesex, Norfolk, Plymouth, Worcester; VT: Caledonia, Rutland, Windham, Windsor; NH: Carroll; ME: Aroostook.

Seasonal abundance: *D. blarinae* has been collected most frequently during the fall.

Host preferences: This species is found on shrews (89%) and ecological associates of shrews (11%): *B. brevicauda*,* *P. leucopus*,* *P. maniculatus*, *Sorex palustris*, *M. pennsylvanicus*, and *R. norvegicus*.

Previous records: Fox (1940), Fuller (1943), Cressey (1961), Parsons (1962), Mathewson and Hyland (1964), Osgood (1964), and Hopkins and Rothschild (1966).

New records: A total of 14 males and 14 females was collected from 10 hosts representing 2 species.

Nearctopsylla genalis genalis (Baker), 1904

Distribution: MASS: Hampshire, Franklin, Worcester; VT: Caledonia, Rutland, Windham; NH: Carroll.

Seasonal abundance: *N. g. genalis* has been taken during all seasons but most frequently during the fall and winter.

Host preferences: This species is found on shrews (74%), shrew predators (9%), and other small mammals (17%). *B. brevicauda*,* *M. erminea*, *C. gapperi*, *G. volans*, *S. carolinensis*, *Sorex cinereus*, and *C. cristata*.

Previous records: Fox (1940), Fuller (1943), Parsons (1962), and Osgood (1964).

New records: Six males and 12 females were taken from 8 short-tailed shrews.

Stenoponia americana (Baker), 1899

Distribution: RI: Kent, Washington; MASS: Barnstable, Bristol, Dukes, Franklin, Hampshire, Middlesex, Plymouth; VT: Rutland; ME: Penobscot.

Seasonal abundance: *S. americana* has been taken most frequently in the spring and less frequently in the fall and winter.

Host preferences: This species has been collected from white-footed mice (55%) and ecological associates of this mouse (45%): *P. leucopus** (and nest), *M. pennsylvanicus*, *C. gapperi*, *S. aquaticus*, *Zapus hudsonius*, *R. norvegicus*, and *B. brevicauda*.

Previous records: Baker (1899, 1904), Fox (1940), Fuller (1943), Cressey (1961), Parsons (1962), Hopkins and Rothschild (1962), Mathewson and Hyland (1964), and Osgood (1964). The female holotype was collected from "*Ecotomys*" (= *Clethrionomys*) in Orono (Penobscot Co.) Maine.

New records: Seventeen males and 15 females were collected from 20 white-footed mice.

CERATOPHYLLIDAE

Ceratophylls celsus celsus Jordan, 1926

C. c. celsus has been collected once in the six state region: a female was taken from the nest of *Petrochelidon albifrons* in Saxton's River (Windham Co.) Vermont by Osgood (1964).

Ceratophyllus diffinis Jordan, 1925

Fuller (1943) reports a collection of a male and female from the nest of *Seiurus aurocapillus* in Holderness (Grafton Co.) New Hampshire.

Ceratophyllus gallinae (Schrank), 1803

Distribution: CONN: Fairfield, Hartford, New Haven, Windham; MASS: Barnstable, Middlesex, Norfolk, Suffolk; VT: Rutland, Windham; NH: Grafton; ME: Kennebec, York.

Seasonal abundance: *C. gallinae* has been reported most frequently during the spring and summer.

Host preferences: This species has been collected from chickens, poultry houses, and man plus the nest of six species of birds: *Sialia sialis*, *Sturnus vulgaris*, *Passer domesticus*, *Iridoprocne bicolor*, *Colaptes auratus*, and *Turdus migratorius*.

Previous records: Fox (1940), Fuller (1943), Shaw and Hovey (1954), Cressey (1961), and Osgood (1964).

Ceratophyllus idius Jordan and Rothschild, 1920

Distribution: CONN: Windham; MASS: Barnstable, Middlesex, Plymouth, Worcester; VT: Rutland; ME.

Seasonal abundance: Specimens of *C. idius* have been collected during the summer and fall.

Host preferences: This flea has been taken from the nests of *I. bicolor* and *S. sialis*.

Previous records: Fox (1940), Fuller (1943), and Osgood (1964).

Ceratophyllus riparius riparius Jordan and Rothschild, 1920

C. r. riparius has been collected from the nest of *Riparia riparia* in Mendon (Rutland Co.) Vermont by Osgood (1964) and from an unidentified host in Durham (Strafford Co.) New Hampshire by Fuller (1943).

Megabothris acerbus (Jordan, 1925)

Distribution: MASS: Hampshire, Worcester; VT: Essex, Rutland; NH: Carroll.

Seasonal abundance: *M. acerbus* has been taken during all seasons but most frequently in the spring.

Host preferences: This species has been collected from *T. striatus*,* the preferred host, its nest, and ecological associates of chipmunks: *C. gapperi*, the nest of *P. leucopus*, and *T. hudsonicus*.

Previous records: Fuller (1943) and Osgood (1964).

New records: Six males and 6 females were collected from 6 chipmunks.

Megabothris asio asio (Baker, 1904)

Distribution: RI: Washington; MASS: Barnstable, Bristol, Dukes, Nantucket, Norfolk, Plymouth; VT: Caledonia, Rutland; NH: Carroll, Merrimack, Strafford.

Seasonal abundance: This species has been collected during all 4 seasons but most frequently in the spring and fall.

Host preferences: *M. a. asio* has been collected from *M. pennsylvanicus** (and nest) (90%), ecological associates of *M. pennsylvanicus* (8%), and a predator (2%): *P. maniculatus*, *P. leucopus*, *B. brevicauda*, *S. aquaticus*, *S. carolinensis* and *O. asio*.

Previous records: Baker (1904), Fox (1939, 1940), Fuller (1943), Cressey (1961), Mathewson and Hyland (1964), and Osgood (1964). The holotype, a female, was collected in Wellesley (Norfolk Co.) Mass. from *O. asio*.

New records: Eight males and 2 females were taken from 6 meadow voles.

Megabothris quirini (Rothschild), 1905

Distribution: VT: Essex, Rutland; NH: Carroll; ME: Piscataquis.

Seasonal abundance: The few specimens reported in New England were collected during the spring and summer.

Host preferences: Single specimens have been collected from *M. pennsylvanicus*, *Microtus chrotorrhinus*, *P. maniculatus*, and *Glaucomys sabrinus*.

Previous records: Fox (1940), Fuller (1943), and Osgood (1964).

Monopsyllus vison vison (Baker), 1904

Distribution: MASS: Franklin, Hampshire; VT: Caledonia, Rutland, Windham; NH: Coos; ME: Hancock, Penobscot, Waldo.

Seasonal abundance: This flea has been collected during the spring, summer, and fall.

Host preferences: *M. v. vison* has been collected from squirrels (96%) and predators (4%): *T. hudsonicus* (and nest), *Mustela vison*, *M. erminea*,* and *T. striatus*.

Previous records: Baker (1904), Fox (1940), Fuller (1943), Cressey (1961), Johnson (1961), and Osgood (1964).

New records: Northfield (Franklin Co.) Mass., 14. IX. 67, 1 male, ex *M. erminea*.

Nosopsyllus fasciatus (Bosc), 1800

Distribution: RI: Newport, Providence, Washington; MASS: Barnstable, Bristol, Dukes, Plymouth, Suffolk, Worcester; NH; ME: Hancock.

Seasonal abundance: About half of the specimens recorded in New England were collected in the fall.

Host preferences: Murine rats (99.8%) are the preferred hosts: *Rattus* spp.,* *M. pennsylvanicus*, *T. striatus*, *Ondatra zibethicus*, and *Homo sapiens*.

Previous records: Robinson (1913), Fox and Sullivan (1925), Fox (1940), Fuller (1943), Knutson and szymkiewicz (1952), Cressey (1961), and Mathewson and Hyland (1964).

New records: The following three records are from *R. norvegicus*: Middleboro (Plymouth Co.) Mass., 22. VIII. 66, 1 female; 18. X. 66, 1 female; Taunton (Bristol Co.) Mass., 20. XI. 64, 1 female.

Opisodasys pseudaretomys (Baker), 1904

Distribution: RI: Washington; MASS: Berkshire, Franklin, Plymouth; VT: Rutland, Windham; NH: Hillsboro; ME: Hancock, Piscataquis.

Seasonal abundance: Most collections of this species were made in the spring; fewest, in the summer and fall.

Host preferences: Flying squirrels (94%) (*G. volans** and *G. sabrinus**) are the preferred hosts; however, single collections were recorded from three other species of mammals (*S. transitionalis*, *B. brevicauda*, and *T. hudsonicus*).

Previous records: Fox (1940), Fuller (1943), Cressey (1961), Parsons (1962), Mathewson and Hyland (1964), and Osgood (1964).

New records: A total of 37 males and 45 females was collected from 14 hosts representing 2 species of flying squirrels.

Orchopeas caedens durus (Jordan), 1929

Distribution: MASS: Franklin, Hampshire, Middlesex; VT: Caledonia, Orleans, Windham; ME: Hancock, Piscataquis.

Seasonal abundance: This species has been collected during the spring, summer, and fall.

Host preferences: *O. c. durus* has been collected from red squirrels (70%) and other sciurids: *T. hudsonicus** (and nest), *S. carolinensis*, and *G. sabrinus*.

Previous records: Fuller (1943), Parsons (1962), and Osgood (1964).

New records: Leverett (Franklin Co.) Mass., 11. III. 67, 1 female, ex *T. hudsonicus*.

Orchopeas howardi howardi (Baker), 1895

Distribution: CONN: New Haven; RI: Kent, Newport, Providence, Washington; MASS: Barnstable, Bristol, Essex, Franklin, Hampshire, Middlesex, Norfolk, Plymouth, Worcester; VT: Windham, Windsor; NH: Carroll, Grafton, Hillsboro, Strafford.

Seasonal abundance: *O. h. howardi* has been collected during all months of the year, but most frequently during the spring.

Host preferences: This species is found most commonly on sciurids (95%), but has also been taken from a wide variety of mammals and birds: *S. carolinensis** (and nest), *T. hudsonicus**, *G. volans**, *G. sabrinus**, *S. floridanus**, *P. lotor**, *P. leucopus**, *T. striatus**, *R. norvegicus*, *U. cinereoargenteus*, *M. frenata**, *H. sapiens*, *O. asio*, *M. monax*, *M. pennsylvanicus* and the nests of *Progne subis* and *Callus domesticus*.

Previous records: Baker (1898, 1904), Fox (1940), Fuller (1943), Shaw and Clark (1953), Cressey (1961), Parsons (1962), Mathewson and Hyland (1964), and Osgood (1964).

New records: A total of 101 males and 192 females was collected from 82 hosts representing 9 species.

Orchopeas leucopus (Baker), 1904

Distribution: RI: Newport, Providence, Washington; MASS: Barnstable, Bristol, Dukes, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Worcester; VT: Caledonia, Rutland; NH: Rockingham; ME: Piscataquis.

Seasonal abundance: *O. leucopus* has been recorded most frequently during the spring and fall months.

Host preferences: Species of *Peromyscus* are the preferred hosts (92%) but it has also been recovered from a wide variety of other mammals: *P. leucopus** (and nest), *P. maniculatus**, *C. gapperi**, *M. pennsylvanicus**, *B. brevicauda**, *G. volans*, *R. norvegicus**, *M. musculus*, *T. hudsonicus**, *T. striatus*, and *V. fulva*.

Previous records: Fox (1940), Fuller (1943), Cressey (1961), Parsons (1962), Mathewson and Hyland (1964), and Osgood (1964).

New records: A total of 154 males and 238 females was collected from 131 hosts of 7 species.

***Oropsylla arctomys arctomys* (Baker), 1904**

Distribution: CONN: Fairfield, Litchfield, Middlesex, New London, Tolland; RI: Providence, Washington; MASS: Barnstable, Bristol, Essex, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester; VT: Caledonia, Orleans, Rutland; NH: Merrimack.

Seasonal abundance: Collections of *O. a. arctomys* were made during the spring and summer months.

Host preferences: This species has been recovered from woodchucks (92%), predators (4%), and other mammals: *M. monax**, *M. mephitis**, *Strix varia*, *V. fulva*, *C. familiaris**, *M. frenata*, *S. floridanus*, *S. carolinensis*, *R. norvegicus**, and *C. gapperi*.

Previous records: Fox (1940), Fuller (1943), Cressey (1961), Parsons (1962), Mathewson and Hyland (1964), and Osgood (1964).

New records: Eight males and 30 females were collected from 9 hosts of 4 species.

LEPTOPSYLLIDAE

***Leptopsylla segnis* (Schonherr), 1811**

Distribution: RI: Providence; MASS: Middlesex, Suffolk.

Seasonal abundance: *L. segnis* has been collected during the summer and fall months.

Host preferences: While *M. musculus* is the preferred host, the majority of New England specimens have been taken from *Rattus* spp. (99%).

Previous records: Robinson (1913), Fox and Sullivan (1925), and Fuller (1943).

***Odontopsyllus multispinosus* (Baker), 1898**

Distribution: RI: Washington; MASS: Barnstable, Bristol, Dukes, Franklin, Hampshire, Norfolk, Plymouth, Worcester.

Seasonal abundance: Collections of this species have been most abundant in the spring; however, like *C. simplex*, this may be related to the seasonality of rabbit trapping.

Host preferences: Leporids are the preferred host although a single collection is reported from a skunk: *S. floridanus**, *S. transitionalis**, *L. americanus*, and *M. mephitis**.

Previous records: Fox (1940), Fuller (1943), Cressey (1961), Parsons (1962), and Mathewson and Hyland (1964).

New records: Sixteen males and 15 females were collected from 16 hosts of 3 species.

***Peromyscopsylla catatina* (Jordan), 1928**

Distribution: RI: Washington; MASS: Franklin, Hampshire, Norfolk, Worcester; NH: Carroll; ME: Piscataquis.

Seasonal abundance: *P. catatina* has been collected most frequently during the fall.

Host preferences: This flea has been recovered from several species of small mammals: *C. gapperi*,* *P. maniculatus*,* *M. pennsylvanicus*, *P. leucopus*, *T. ludsonicus*, and *B. breviceauda*.

Previous records: Fox (1940), Fuller (1943), Johnson and Traub (1954), Mathewson and Hyland (1964), and Osgood (1964).

New records: Northfield (Franklin Co.) Mass., 9. XI. 67, 1 male, *ex P. maniculatus*; 10. XI. 67, 1 female, *ex P. maniculatus*; Belchertown (Hampshire Co.) Mass., 4. II. 68, 1 female, *ex C. gapperi*.

***Peromyscopsylla hamifer hamifer* (Rothschild), 1906**

Distribution: MASS: Bristol, Plymouth; NH: Carroll; ME: Penobscot.

Seasonal abundance: *P. h. hamifer* has been collected during the fall and winter months in New England.

Host preferences: This species has been collected from voles and predators: *M. pennsylvanicus*,* *C. gapperi*,* and *M. vison*.

Previous records: Johnson and Traub (1954) and Cressey (1961).

New records: Berkley (Bristol Co.) Mass., 28. X. 67, 1 male, 1 female, *ex M. pennsylvanicus*; 28. X. 67, 1 male, 1 female, *ex M. pennsylvanicus*; Taunton (Bristol Co.) Mass., 12. I. 65, 1 female, *ex C. gapperi*.

***Peromyscopsylla hesperomys hesperomys* (Baker), 1904**

Distribution: MASS: Franklin, Hampden, Middlesex, Norfolk; VT: Rutland; NH: Carroll, Grafton; ME: Cumberland.

Seasonal abundance: This species has been collected during all seasons of the year, but most frequently during the spring and fall.

Host preferences: Most of the collections of *P. h. hesperomys* have been made from *Peromyscus* species (87%) although it has been recovered from other small mammals: *P. leucopus** (and nest), *P. maniculatus*, *Pipistrellus subflavus*, *M. pennsylvanicus*, *B. breviceauda*.

Previous records: Baker (1904), Fox (1940), Fuller (1943), Johnson and Traub (1954), Cressey (1961), Parsons (1962), and Osgood (1964).

New records: Nine males and 6 females were collected from 7 white-footed mice.

***Peromyscopsylla scotti* (Fox, 1939)**

P. scotti has been reported by Fox (1940) and Johnson and Traub (1954) from the island of Martha's Vineyard (Dukes Co.) Mass. Fox (1940) reports two collections of this species from Edgartown *ex P. leucopus*: a female collected 29. X. 37 and a male, designated as the allotype, collected 13. XI. 37.

ISCHINOPSYLLIDAE

***Myodopsylla insignis* (Rothschild), 1903**

Distribution: CONN: Hartford, Litchfield, New Haven; MASS: Barnstable, Berkshire, Hampden, Norfolk; VT: Bennington, Rutland; NH: Merrimack; ME: Piscataquis.

Seasonal abundance: This species has been collected during all seasons of the year.

Host preferences: Members of the genus *Myotis* are the preferred hosts of this flea, although it has been recovered from other species of bats: *Myotis lucifugus*,* *Myotis keenii*,* *Myotis subulatus*, *P. subflavus*, and *Eptesicus fuscus*.*

Previous records: Chapman (1919) (the types of *M. subulata* (= *M. insignis*)), Fox (1940), Fuller (1943), Smit (1955), Hopkins and Rothschild (1956), Parsons (1962), and Mathewson and Hyland (1964).

New records: A total of 44 males and 70 females was collected from 49 bats of 3 species.

Several species of fleas have not yet been reported in New England, but possibly do occur here.

Ceratophyllus scopulorum Holland has been collected by Benton and Shatrau (1962) on Kent Island, New Brunswick, 20 miles off the coast of Maine. They reported collecting 232 specimens from the nests of swallows. These workers (1965) also list three additional species of bird fleas of the genus *Ceratophyllus* (*C. borealis*, *C. garei*, and *C. rossitensis swansoni*) and Brown (1968) describes a fourth (*C. sternacuminatus*); all have been collected in eastern North America but not yet in New England.

Like the bird fleas, the bat fleas are poorly represented in collections. *Nycteridopsylla chapini* Jordan was collected in New York state by Benton (1955). This species will probably be taken in New England on *E. fuscus*, the preferred host.

Two other species of fleas—*Corrodopsylla hamiltoni* (Traub) and *Orchopeas sexdentatus pennsylvanicus* (Jordan)—might occur in extreme western Connecticut but would be limited by the range of the preferred hosts—*Cryptotis parva* and *Neotoma* spp., respectively.

HOST-PARASITE RELATIONSHIPS

The following is a synopsis of the host-flea relationships reported in New England. Fleas are listed in the order of abundance that they have been recorded from each host.

Mammals

<i>Didelphis marsupialis</i> (Opossum)	<i>Orchopeas leucopus</i> *
<i>Ctenocephalides f. felis</i> *	<i>Epitedia wenmanni</i> *
<i>Ctenophthalmus p. pseudagyrtes</i>	<i>Opisodasys pseudarctomys</i>
<i>Sorex cinereus</i> (Masked Shrew)	<i>Corrodopsylla c. curvata</i>
<i>Nearctopsylla g. genalis</i>	<i>Stenoponia americana</i>
<i>Sorex palustris</i> (Water Shrew)	<i>Megabothris a. asio</i>
<i>Doratopsylla blarinae</i>	<i>Peromyscopsylla catatina</i>
<i>Sorex</i> spp.	<i>Parascalopus breweri</i> (Hairy-tailed Mole)
<i>Corrodopsylla c. curvata</i>	<i>Ctenophthalmus p. pseudagyrtes</i>
<i>Blarina brevicauda</i> (Short-tailed Shrew)	<i>Scalopus aquaticus</i> (Eastern Mole)
<i>Ctenophthalmus p. pseudagyrtes</i> *	<i>Hystrihopsylla tahavua</i>
<i>Doratopsylla blarinae</i> *	<i>Stenoponia americana</i>
<i>Nearctopsylla g. genalis</i> *	<i>Megabothris a. asio</i>

- Condylura cristata* (Star-nosed Mole)
Ctenophthalmus p. pseudagyrtes
Nearctopsylla g. genalis
 "Mole"
Ctenophthalmus p. pseudagyrtes
Myotis lucifugus (Little Brown *Myotis*)
*Myodopsylla insignis**
Myotis keenii (Keen's *Myotis*)
*Myodopsylla insignis**
Myotis subulatus (Small-footed *Myotis*)
Myodopsylla insignis
Eptesicus fuscus (Big Brown Bat)
*Myodopsylla insignis**
Pipistrellus subflavus (Eastern Pipistrelle)
Myodopsylla insignis
Peromyscopsylla h. hesperomys
 "Bat"
Myodopsylla insignis
Homo sapiens (Man)
Ctenocephalides f. felis
Nosopsyllus fasciatus
Ceratophyllus gallinae
Orchopeas h. howardi
 "Clothing"
Ceratophyllus gallinae
 "Building," "House," etc.
Ctenocephalides f. felis
Ctenocephalides canis
Sylvilagus floridanus (Eastern cottontail)
*Cediopsylla simplex**
*Odontopsyllus multispinosus**
*Orchopeas h. howardi**
Oropsylla a. arctomys
Ctenophthalmus p. pseudagyrtes
Sylvilagus transitionalis (New England cottontail)
*Cediopsylla simplex**
*Odontopsyllus multispinosus**
Opisodasys pseudarctomys
Sylvilagus spp.
Cediopsylla simplex
Odontopsyllus multispinosus
Orchopeas h. howardi
Epitedia wenmanni
Lepus americanus (Snowshoe Hare)
*Cediopsylla simplex**
Hoplopsyllus g. lynx
Odontopsyllus multispinosus
- Oryctolagus cuniculus* (Domestic Rabbit)
*Ctenocephalides f. felis**
Tamias striatus (Eastern chipmunk)
*Megabothris acerbus**
*Tamiophila grandis**
*Ctenophthalmus p. pseudagyrtes**
*Orchopeas h. howardi**
Orchopeas leucopus
Monopsyllus v. vison
Mosopsyllus fasciatus
 Nest of *Tamias striatus*
Tamiophila grandis
Megabothris acerbus
Marmota monax (Woodchuck)
*Oropsylla a. arctomys**
Ctenocephalides canis
Ctenophthalmus p. pseudagyrtes
Orchopeas h. howardi
Sciurus carolinensis (Gray Squirrel)
*Orchopeas h. howardi**
Orchopeas c. durus
*Epitedia wenmanni**
Nearctopsylla g. genalis
Oropsylla a. arctomys
Cediopsylla simplex
Ctenocephalides f. felis
Megabothris a. asio
 Nest of *Sciurus carolinensis*
Orchopeas h. howardi
Tamiasciurus hudsonicus (Red Squirrel)
Monopsyllus v. vison
*Orchopeas h. howardi**
*Orchopeas c. durus**
Megabothris acerbus
Chaetopsylla lotoris
Epitedia faceta
*Epitedia wenmanni**
*Orchopeas leucopus**
Ctenophthalmus p. pseudagyrtes
Tamiophila grandis
*Cediopsylla simplex**
 Nest of *Tamiasciurus hudsonicus*
Monopsyllus v. vison
Orchopeas c. durus
Glaucomys volans (Southern Flying Squirrel)
*Opisodasys pseudarctomys**
*Orchopeas h. howardi**
*Epitedia faceta**

- Epitedia wenmanni*
Orchopeas leucopus
Nearctopsylla g. genalis
Conorhinopsylla stanfordi
Glaucomys sabrinus (Northern Flying Squirrel)
*Opiscladys pseudarctomys**
*Orchopeas h. howardi**
Orchopeas c. durus
Megabothris quirini
Conorhinopsylla stanfordi
Peromyscus maniculatus (Deer Mouse)
*Orchopeas leucopus**
*Epitedia wenmanni**
*Peromyscopsylla catatina**
*Ctenophthalmus p. pseudagyrtes**
Peromyscopsylla h. hesperomys
Doratopsylla blarinae
Megabothris a. asio
Megabothris quirini
Peromyscus leucopus (White-footed Mouse)
*Orchopeas leucopus**
*Epitedia wenmanni**
*Stenoponia americana**
*Peromyscopsylla h. hesperomys**
*Ctenophthalmus p. pseudagyrtes**
*Orchopeas h. howardi**
*Doratopsylla blarinae**
Cediopsylla simplex
Peromyscopsylla scotti
Peromyscopsylla catatina
Tamiophila grandis
Megabothris a. asio
 Nest of *Peromyscus leucopus*
Orchopeas leucopus
Epitedia wenmanni
Ctenophthalmus p. pseudagyrtes
Stenoponia americana
Megabothris acerbus
Peromyscopsylla h. hesperomys
Peromyscus spp.
Orchopeas leucopus
Orchopeas h. howardi
Peromyscopsylla h. hesperomys
Clethrionomys gapperi (Gapper's Red-backed Vole)
*Ctenophthalmus p. pseudagyrtes**
*Epitedia wenmanni**
- Orchopeas leucopus*
Peromyscopsylla catatina
Stenoponia americana
Nearctopsylla g. genalis
Catallagia borealis
Megabothris acerbus
*Peromyscopsylla h. hamifer**
Oropsylla a. arctomys
*Atyphloceras bishopi**
Microtus pennsylvanicus (Meadow Vole)
*Ctenophthalmus p. pseudagyrtes**
*Megabothris a. asio**
Stenoponia americana
*Atyphloceras bishopi**
*Orchopeas leucopus**
*Peromyscopsylla h. hamifer**
*Epitedia wenmanni**
Peromyscopsylla catatina
Peromyscopsylla h. hesperomys
Hystrichopsylla tahaviana
Nosopsyllus fasciatus
Rhadinopsylla orama
Catallagia borealis
Megabothris quirini
Doratopsylla blarinae
Orchopeas h. howardi
 Nest of *Microtus pennsylvanicus*
Epitedia wenmanni
Megabothris a. asio
Microtus breweri (Beach Vole)
Epitedia wenmanni
Microtus chrotorrhinus (Rock Vole)
Megabothris quirini
Microtus pinetorum (Pine Vole)
Ctenophthalmus p. pseudagyrtes
Synaptomys cooperi (Southern Bog Lemming)
*Ctenophthalmus p. pseudagyrtes**
Ondatra zibethicus (Muskrat)
Nosopsyllus fasciatus
 "Mouse"
Epitedia wenmanni
Ctenophthalmus p. pseudagyrtes
Leptopsylla segnis
 "Rodent Nest"
*Orchopeas leucopus**
Ctenophthalmus p. pseudagyrtes
Megabothris a. asio

Rattus norvegicus (Norway Rat);	Chaetopsylla lotoris*
Rattus rattus rattus (Black Rat);	Orchopeas h. howardi
and/or	Cediopsylla simplex
Rattus rattus alexandrinus (Roof Rat)	Procyon lotor (Raccoon)
Xenopsylla cheopis	Chaetopsylla lotoris*
Nosopsyllus fasciatus*	Orchopeas h. howardi*
Leptopsylla segnis	Epitedia wenmanni*
Ctenocephalides canis	Ctenocephalides f. felis*
Ctenophthalmus p. pseudagyrtes*	Mustela frenata (Long-tailed Weasel)
Atyphloceras bishopi*	Tamiophila grandis
Epitedia wenmanni*	Orchopeas h. howardi*
Stenoponia americana	Oropsylla a. arctomys
Orchopeas h. howardi	Ctenophthalmus p. pseudagyrtes*
Orchopeas leucopus*	Epitedia wenmanni
Oropsylla a. arctomys*	Mustela erminea (Ermine)
Doratopsylla blarinae	Monopsyllus v. vison*
Mus musculus (House Mouse)	Epitedia wenmanni
Orchopeas leucopus	Nearctopsylla g. genalis
Xenopsylla cheopis	Mustela vison (Mink)
Zapus hudsonius (Meadow Jumping Mouse)	Monopsyllus v. vison
Stenoponia americana	Epitedia wenmanni
Napaeozapus insignis (Woodland Jumping Mouse)	Mephitis mephitis (Striped Skunk)
Ctenophthalmus p. pseudagyrtes	Oropsylla a. arctomys*
Erethizon dorsatum (Porcupine)	Ctenocephalides f. felis*
Epitedia wenmanni*	Epitedia wenmanni*
Canis familiaris (Dog)	Odontopsyllus multispinosus*
Ctenocephalides f. felis*	Felis domestica (Domestic Cat)
Ctenocephalides canis*	Ctenocephalides f. felis*
Tamiophila grandis	Ctenocephalides canis
Oropsylla a. arctomys*	Cediopsylla simplex
Vulpes fulva (Red Fox)	Xenopsylla cheopis
Cediopsylla simplex*	Lynx canadensis (Lynx)
Chaetopsylla lotoris	Hoplopsyllus g. lynx
Oropsylla a. arctomys	Lynx rufus (Bobcat)
Orchopeas leucopus	Cediopsylla simplex
Urocyon cinereoargenteus (Gray Fox)	Chaetopsylla lotoris
	Lynx spp.
	Hoplopsyllus g. lynx
	Cedopsylla simplex

Birds

Gallus domesticus (Chicken)	Megabothris a. asio
Ceratophyllus gallinae	Ctenophthalmus p. pseudagyrtes
"Poultry House"	Strix varia (Barred Owl)
Ceratophyllus gallinae	Oropsylla a. arctomys
Orchopeas h. howardi	Nest of Colaptes auratus (Yellow-shafted Flicker)
Otus asio (Screech Owl)	

Ceratophyllus gallinae	Nest of Turdus migratorius (Robin)
Nest of Iridoprocne bicolor (Tree Swallow)	Ceratophyllus gallinae
Ceratophyllus idius	Nest of Sialia sialis (Eastern Bluebird)
Ceratophyllus gallinae	Ceratophyllus gallinae
Nest of Riparia riparia (Bank Swallow)	Ceratophyllus idius
Ceratophyllus r. riparius	Nest and Stomach of Sturnus vulgaris (Starling)
Nest of Progne subis (Purple Martin)	Ceratophyllus gallinae
Orchopeas h. howardi	Nest of Seiurus aurocapillus (Ovenbird)
Nest of Petrochelidon albifrons (Northern Cliff Swallow)	Ceratophyllus diffinis
Ceratophyllus c. celsus	Nest of Passer domesticus (House Sparrow)
Nest of "Swallow"	Ceratophyllus gallinae
Ceratophyllus idius	

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